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Process standardization and shelf life studies of peanut milk

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Abstract
Groundnut (Arachis hypogaea L.), also known as peanut, among the oilseed crops it is principal one. It is the world 4th most important source of edible oil and 3rd most important source of vegetable protein. Peanuts are rich source of the protein and one of the world's leading oil seed crops. It is an excellent source of vitamins B complex, vitamin E and essential amino acids. Peanuts contain many bioactive compounds, such as flavonoids, phenolic acids, and plant sterols. Flavonoids confer many benefits. In foods, flavonoids are responsible for color, taste, prevention of fat oxidation, and protection of vitamins and enzymes.

Peanut milk is plant based milk. It is lack of lactose so useful to the lactose intolerant people. It is prepared by roasting peanuts (100gm) at 130° C for 30 minutes in micro oven, at 150° C for 15 min in hot air oven, last one without treatment then followed by soaking, de-skinning, grounding and filtering the slurry the filtrate is called as peanut milk. Then the slurry boiled, homogenized, pasteurized and stored. The three different peanut milk samples packaged in glass bottles, Pet bottles and LDPE sachets were stored in the refrigerator for 28 days and at room temperature for three days. The quality of the three different peanut milk samples were evaluated by assessing moisture content, protein content, fat content, carbohydrates content, ash content, pH values, titratable acidity, and microbial examination.

The proximate analysis of normal soaking milk sample were moisture content was varied between 88.05 to 88.53%; protein, 3.55 to 3.60%; fat,2.07 to 2.08;carbohydrates,5.55 to 5.57;ash,0.21 to0.24%,titratable acidity,0.8ml to 1.2 ml; pH,6.25 to 6.32;TS,11.04 to 11.18. the proximate analysis of micro oven treatment milk sample were moisture content was varied between87.47 to 87.55%; protein 3.3%; fat,3.38 to 3.42;carbohydrates,4.67 to 4.68;ash,0.16 to 0.17%,titratable acidity,1.0 ml to 1.3 ml; pH,6.35 to 6.38;TS,10.15 to 10.21.the proximate analysis of hot air oven treatment milk sample were moisture content was varied between 86.61 to 86.73%; protein 3.22 to 3.23%; fat,2.68 to 2.70;carbohydrates4.47 to 4.48;ash, 0.145 to 0.15%,titratable acidity,1.0 ml to 1.3ml;pH,6.29 to 6.32;TS,10.10 to 10.15 and standard plate count were analyzed for three different samples.

Based on the results it was concluded that the micro oven treatment milk sample was found the most similar and best to the control sample (cow milk) although it had the negative effect on the protein.

Keywords: peanut milk, homogenization, lactose, proximate analysis

Introduction

Groundnut (Arachis hypogaea L.), also known as peanut, among the oilseed crops it is principal one. Groundnut is the 13 most important food crop of the world. It is the world 4th most important source of edible oil and 3rd most important source of vegetable protein. Groundnut is called as the 'King' of oilseeds. It is one of the most important food and cash crops of our country. While being a valuable source of all the nutrients, it is a low priced commodity. Groundnut is also called as wonder nut and poor men's cashew nut. In the India is one of the largest producers of oilseeds in the world and occupies an important position in the Indian agricultural economy. It occupies the first place in area and second in production. The major states are Gujarat, Andhra Pradesh, Rajasthan, Karnataka, and Maharashtra. Peanuts are rich source of the protein and one of the world's leading oil seed crops. It is an excellent source of vitamins B complex, vitamin E and essential amino acids. Peanuts contain many bioactive compounds, such as flavonoids, phenolic acids, plant sterols, and stilbenes (Francisco & Resurreccion, 2008).The flavonoids content of peanuts is well documented; Yang, Liu, and Halim (2009) determined that often nuts, including legume peanuts, peanuts had the third highest total flavonoid content (Yang, Liu, & Halim, 2009). Flavonoids confer many benefits. In foods, flavonoids are responsible for colour, taste, prevention of fat oxidation, and protection of vitamins and enzymes (Yao *et al*., 2004). In humans, flavonoids were reported to be protective against cardiovascular diseases, cancers, and age-related diseases.

Peanut milk is plant based milk. It is prepared by soaking, de-skinning, grounding and filtering the slurry the filtrate is called as peanut milk. It is lack of lactose so useful to the lactose intolerant people.

Materials and Methods

Raw Materials the fresh peanuts used for the study were procured from local market, Hyderabad, Telangana state.

Preparation of Peanut Milk

Normal soaking

100g of peanuts were soaked in water in a ratio of 1:3 (kernel: water) for 14 hours and they were be de-skinned. The de-skinned kernels were washed with water and ground with hot water in a ratio of 1:5 (kernels to water) in the grinder. The slurry formed sieved by muslin cloth and peanut milk was produced and packed in three different glass bottle pet bottle and LDPE sachets packaging materials. Storage studies were conducted at room

temperature and refrigerator temperature.

Micro- Oven Roasting

Sorted peanut seeds were roasted at 130°C for 28 min in an oven. The seeds were soaked in water in a ratio 1:3(kernel: water) for 14 h and they were de-skinned. The de-skinned peanut kernels were washed with clean water. The kernels were mixed with water in a ratio of 1:5 [peanuts (g): water (ml)] and transferred to a blender where they were blended for 5 min. The slurry formed sieved by muslin cloth and peanut milk was produced and packed in three different glass bottle pet bottle and LDPE sachets packaging materials. Storage studies were conducted at room temperature and refrigerator temperature.

Hot Air- Oven Roasting

Sorted peanut seeds were roasted at 150°C for 15 min in an oven.

The seeds were soaked in water in a ratio 1:3 (kernel: water) for 14 h and they were de-skinned. The de-skinned peanut kernels were washed with clean water. The kernels were mixed with water in a ratio of 1:5 [peanuts (g): water (ml)] and transferred to a blender where they were blended for 5 min.

The slurry formed sieved by muslin cloth and peanut milk was produced and packed in three different glass bottle pet bottle and LDPE sachets packaging materials storage studies were conducted at room temperature and refrigerator temperature.

Normal soaking peanut milk Micro oven and Hot air oven peanut milk

Fig 1: Prepared Peanut Milk Samples with Three Different Treatments

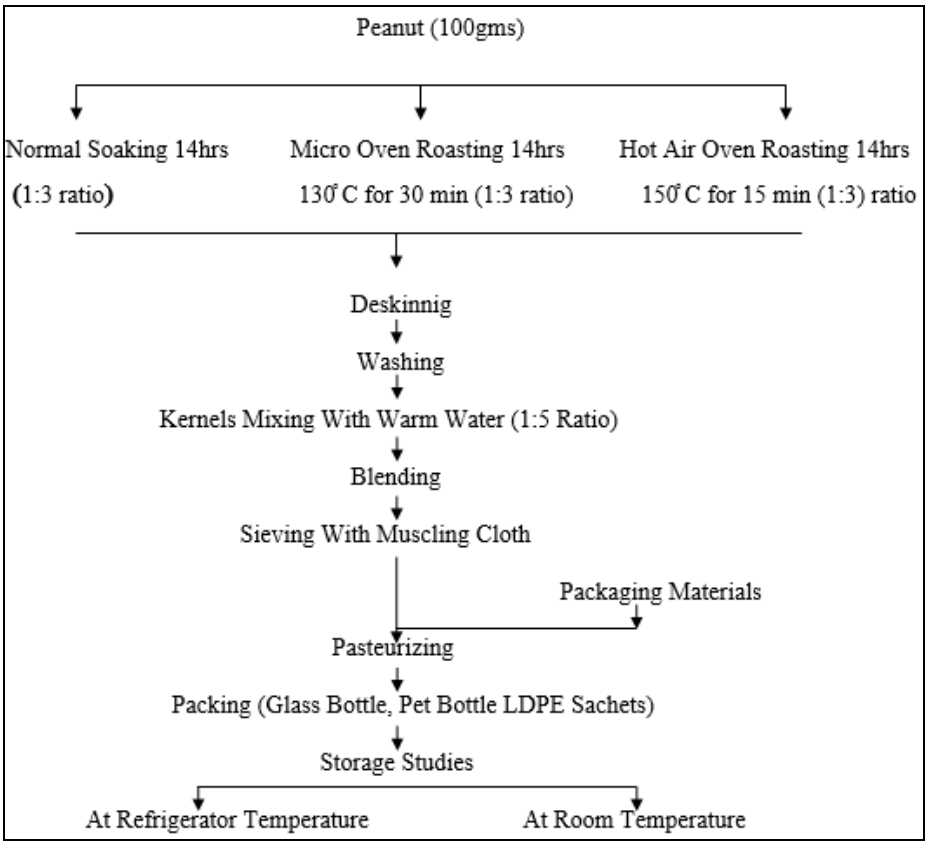

Fig 2: Flow Chart for Preparation of Peanut Milk

Results and Discussion

The results obtained from the work on process standardization and shelf life study of peanut milk is presented in this chapter. The results were tabulated and discussed keeping in view the objectives of the study.

Physico-Chemical Parameters of Three Different Peanut Milk Sample at refrigerator condition

Moisture content of Peanut milk samples

In all three different form (Normal soaking, Microwave oven130℃ 30 min, Hot air oven150℃ C for 15 min treatment) milk sample the moisture contents is decreased as the temperature increases 88.82, 87.68 and 86.86 respectively. In micro oven peanut milk 87.55, 87.50 and 87.47 in glass bottle, pet bottle and LDPE sachets respectively. In hot air oven peanut milk 86.73, 86.68 and 86.61 in glass bottle, pet bottle and LDPE sachets respectively.

Because of the packaging material properties the water vapor transmission rate varies the moisture content is decreased. Compared to the control sample as cow milk the moisture content is 87.99 %. From the above table micro oven treatment sample is taken as the best sample.

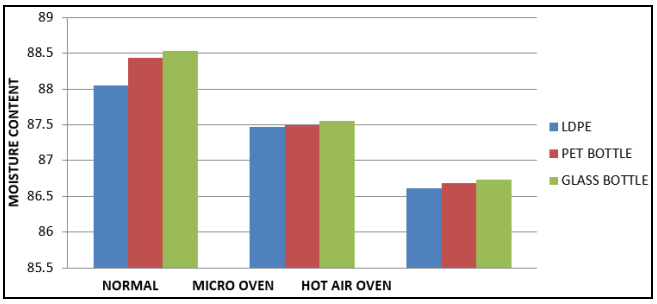

Fig 3: Moisture content of Peanut milk 28th day

Protein Content of Peanut Milk samples

The protein content in the three different samples were decreased as temperature increased in this pattern N.S>M.O>H.O. As the roasting temperature increases the protein contents decreases (150℃ C, 15 Min) compared to normal soaking treatment. The higher protein content were observed in normal soaking milk sample is 3.56, 3.54 and3.52 in glass bottle, pet bottle and LDPE sachets respectively. In micro oven milk sample 3.28, 3.3 and 3.26 in glass bottle, pet bottle and LDPE sachets respectively which is similar to the control sample (cow milk) contains 3.29. In hot air oven milk sample 3.21, 3.2 and 3.2 in glass bottle, pet bottle and LDPE sachets respectively.

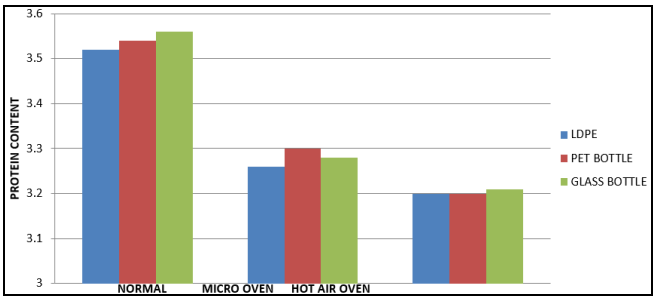

Fig 4: Protein content of Peanut milk 28th day

Fat Content of Peanut Milk samples

The fat content of normal soaking milk decreased from 2.15 to 2.05 as the storage time increases the fat content decreased same pattern follows in micro oven and hot air oven from3.49 to 3.4 and 2.77 to 2.67 respectively with minor changes in different packaging materials. Micro-oven treatment milk contains the high amount of fat content (3.4 %) than normal soaking and hot air oven treatment milk (2.68%). The Micro-oven treatment milk fat content (3.4) is nearly equal to control sample (cow milk) contains 3.34 % fat content. Hot air-oven treatment milk contains low amount of fat (2.67) it helpful for the keeping quality of the products as the probability of rancidity taking place would be greatly reduced(Sunny-Roberts *et al*., 2004).

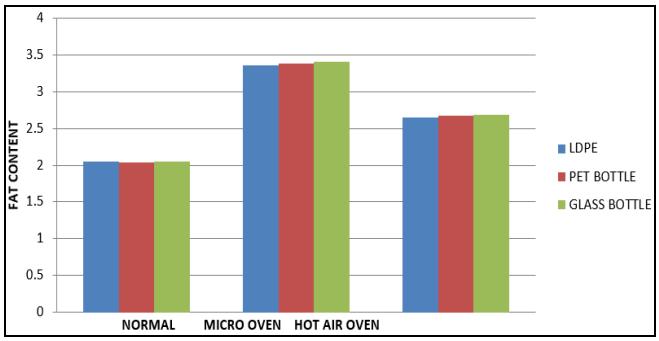

Fig 5: Fat content of Peanut milk 28th day

Carbohydrates Content of Peanut Milk samples

The carbohydrate content in three milk samples were observed, It shows the following pattern N.S.> M.O.> H.O. The highest percentage was in normal soaking milk sample that is 5.53, 5.51 and 5.50 in glass bottle, Pet bottle and LDPE sachets respectively. In micro oven milk sample 4.65, 4.64 and 4.62 in Glass Bottle, Pet Bottle and LDPE sachets respectively. In hot air oven milk sample 4.46, 4.43 and 4.42 in Glass Bottle, Pet Bottle and LDPE sachets respectively.

Comparing to the cow milk sample it contains 4.66 % carbohydrate among the three milk samples micro oven milk sample nearly 4.65% and in Hot air oven milk sample nearly 4.46 %.

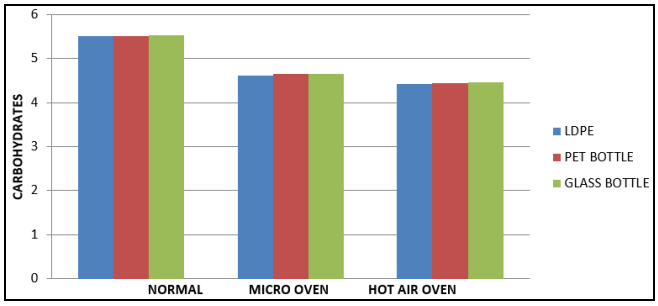

Fig 6: Carbohydrate content of Peanut milk 28th day

Ash content of Peanut milk samples

The Ash content of the three milk samples were observed it shows the following pattern N.S.>M.O.> H.O. In normal soaking milk sample 0.24, 0.23 and 0.21 in Glass bottle, Pet Bottle and LDPE sachet respectively. In micro oven milk sample 0.17, 0.165 and 0.16 in Glass bottle, Pet Bottle and LDPE sachet respectively. In Hot air oven milk sample 0.15, 0.15 and 0.145 in Glass Bottle, Pet Bottle and LDPE sachet respectively. Comparing to the control sample (cow milk) it contains 0.5% ash content normal soaking milk sample contains 0.24% highest, in micro oven milk sample contains 0.17% highest, in Hot air oven milk sample contains 0.15 % highest point.

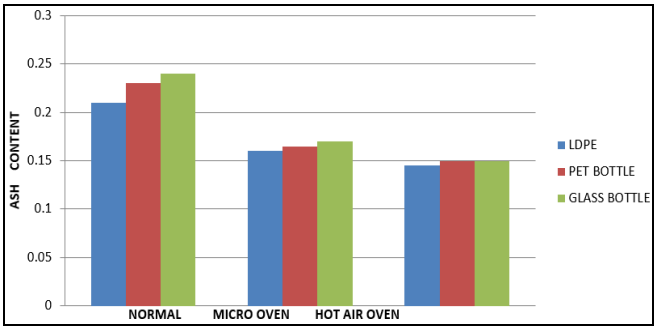

Fig 7: Ash content of Peanut milk 28th day

Titratable acidity of Peanut milk samples

Compared to the control sample cow milk its titratable acidity value is 0.10 ml. In the micro oven treatment peanut milk the value is in the range of 0.3ml to 1.3ml, In glass bottle sample the value is 1.0ml which is similar to the control sample. A slight variation was observed in the remaining material. In hot air oven treatment peanut milk the titratable acidity value 0.3ml to 1.2ml.

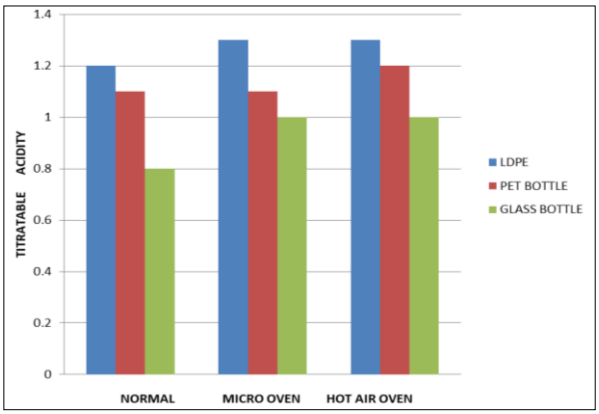

Fig 8: Titratable acidity of Peanut milk 28th day

pH of Peanut milk samples

There was no much difference between the three different peanut milk samples. PH value varies from 6.52 to 6.25 in all three peanut milk samples from1st day to the 28th day. Coming to the packaging material LDPE the value of pH is from 6.52 to 6.25. In Pet bottle the value of pH is from 6.52 to 6.27. In Glass bottle the value of pH is from 6.49 to 6.32. Coming to the control milk sample the value of pH 6.80. Among the all three treatment peanut milk sample the micro oven treatment milk sample pH value (6.38) is near to the control sample (6.8).

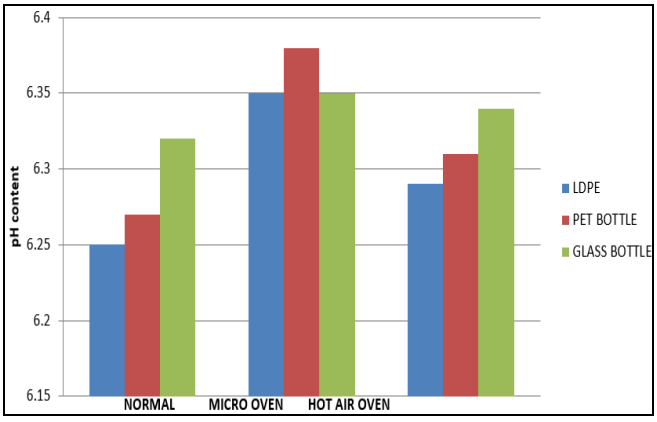

Fig 9: pH of Peanut milk 28th day

Total Solids (GM) of Peanut Milk Samples

Total solids of the three different peanut milk samples were shows the following pattern N> M.O.>H.O. At 28th day maximum total solids were observed in normal soaking peanut milk sample in glass bottle packaging material 11.18g followed by micro oven and hot air oven treatment milk sample10.21g and 10.15 g respectively. Because of the temperature and time parameters influence the total solids in milk samples. Increase in time and temperature total solids and proteins get decreases due to structural changes in protein, it gets denaturation.

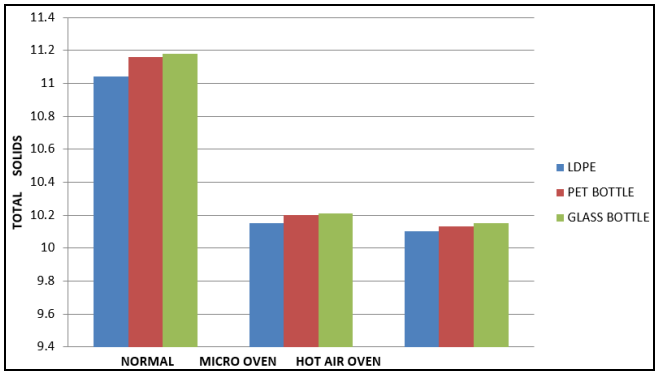

Fig 10: Total solids of Peanut milk 28th day

Microbial Examinations of Peanut Milk Samples

It was observed that standard plate counts of three different peanut milk samples were noted at refrigerator temperature conditions. The colonies count in normal soaking milk sample from 3454 CFU/ml to 16818 CFU/ml. In micro oven treatment peanut milk sample the colonies count from 3181 CFU/ml to 15363 CFU/ml. In the hot air oven peanut milk sample the colonies count from 2727 CFU/ml to 14727 CFU/ml. Glass bottle is the best packaging material for the storage of milk sample.

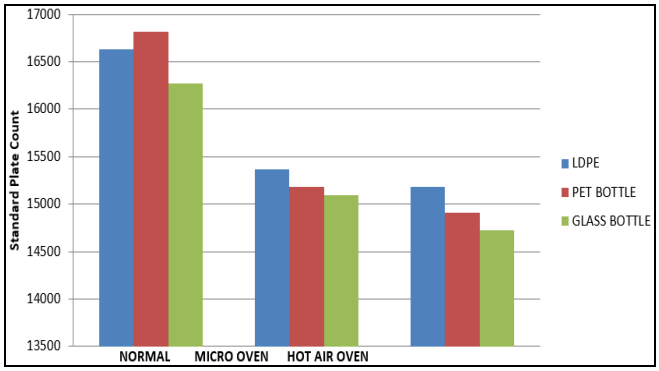

Fig 11: Microbial examinations of peanut milk samples (CFU/ml) 28th day

Conclusion

Peanut milk is plant based milk. It is prepared by soaking, de-skinning, grounding and filtering the slurry the filtrate is called as peanut milk. It is lack of lactose so useful to the lactose intolerant people. The quality of the three different peanut milk samples were evaluated by assessing moisture content, protein content, fat content, carbohydrates content, ash content, pH values, titratable acidity, and microbial examination. Based on the observation it was concluded that processing variables and packaging materials such as normal soaking, micro oven roasting treatment and hot air oven and LDPE Sachets, Pet Bottle and Glass bottle had a

significant effect on the physico-chemical as well as the storage characteristics of peanut milk samples. Among the packaging material Glass bottle shows the best packaging material followed by the Pet bottle then LDPE sachets. The storage period also increases because of its permeability nature. Of the all three treatments micro oven treatment peanut milk sample is the best method which is similar to the control sample.

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